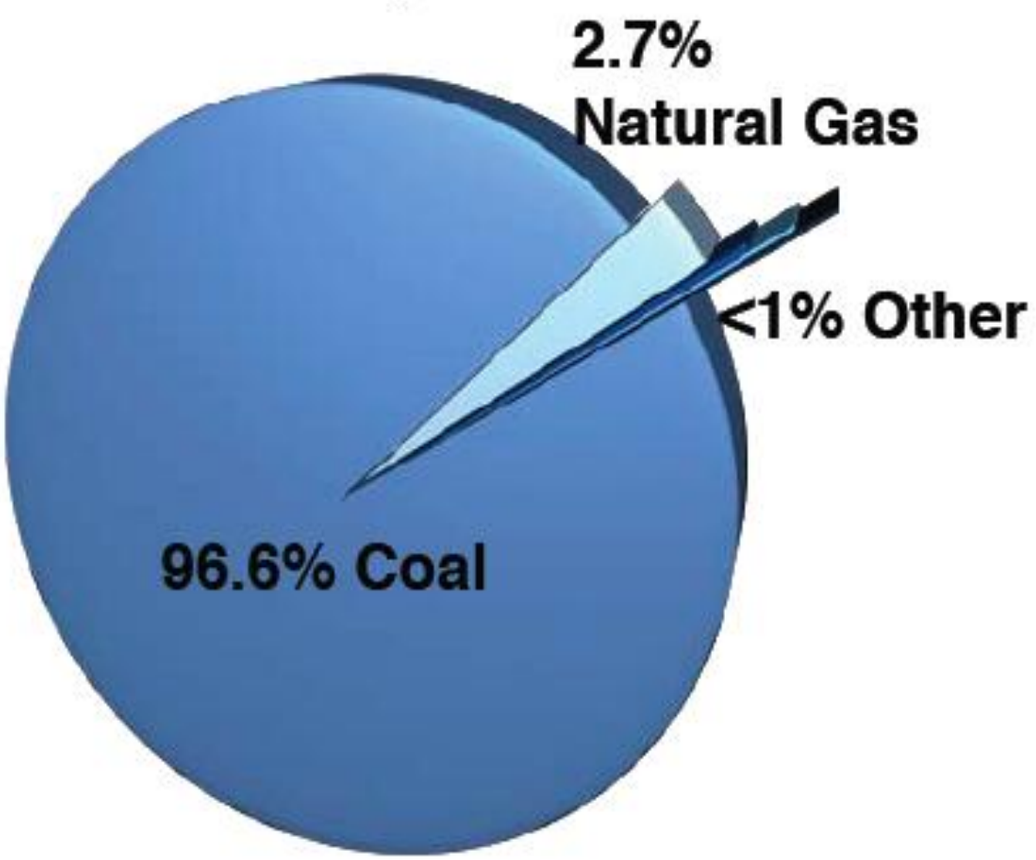
ESN

ENERGY SYSTEMS NETWORK

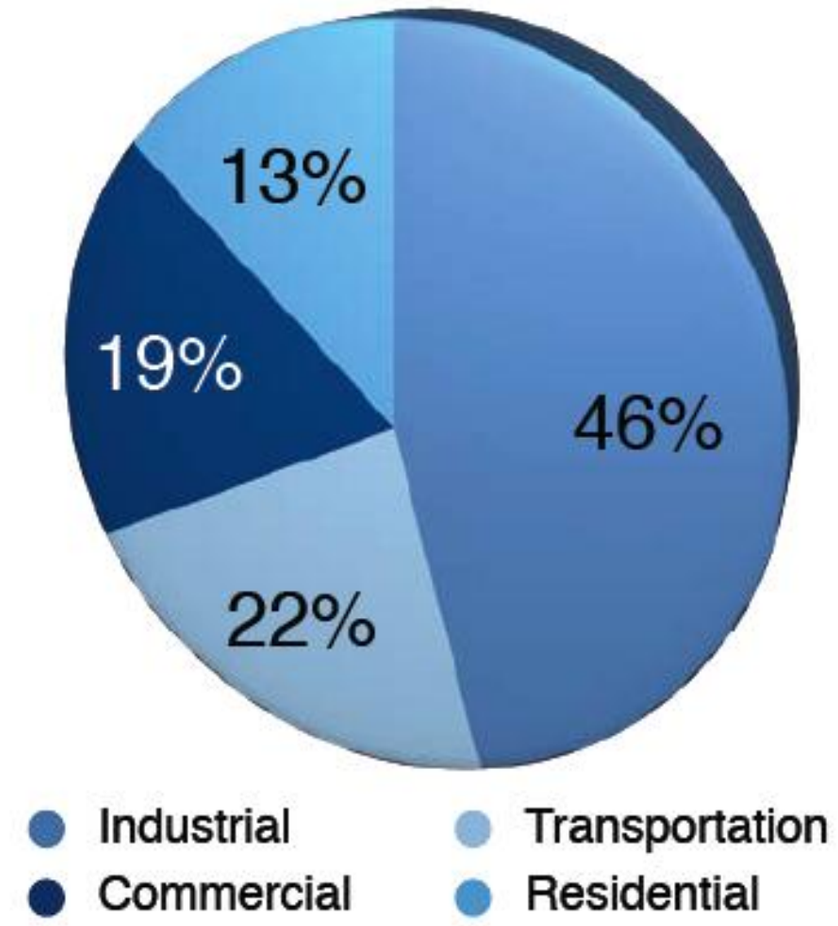
Delivering Energy Systems Solutions

Indiana Energy Mix is Heavy on Utility-Scale Coal, With High Electricity Usage in Industry...

Indiana electric generation mix, 2007[21]

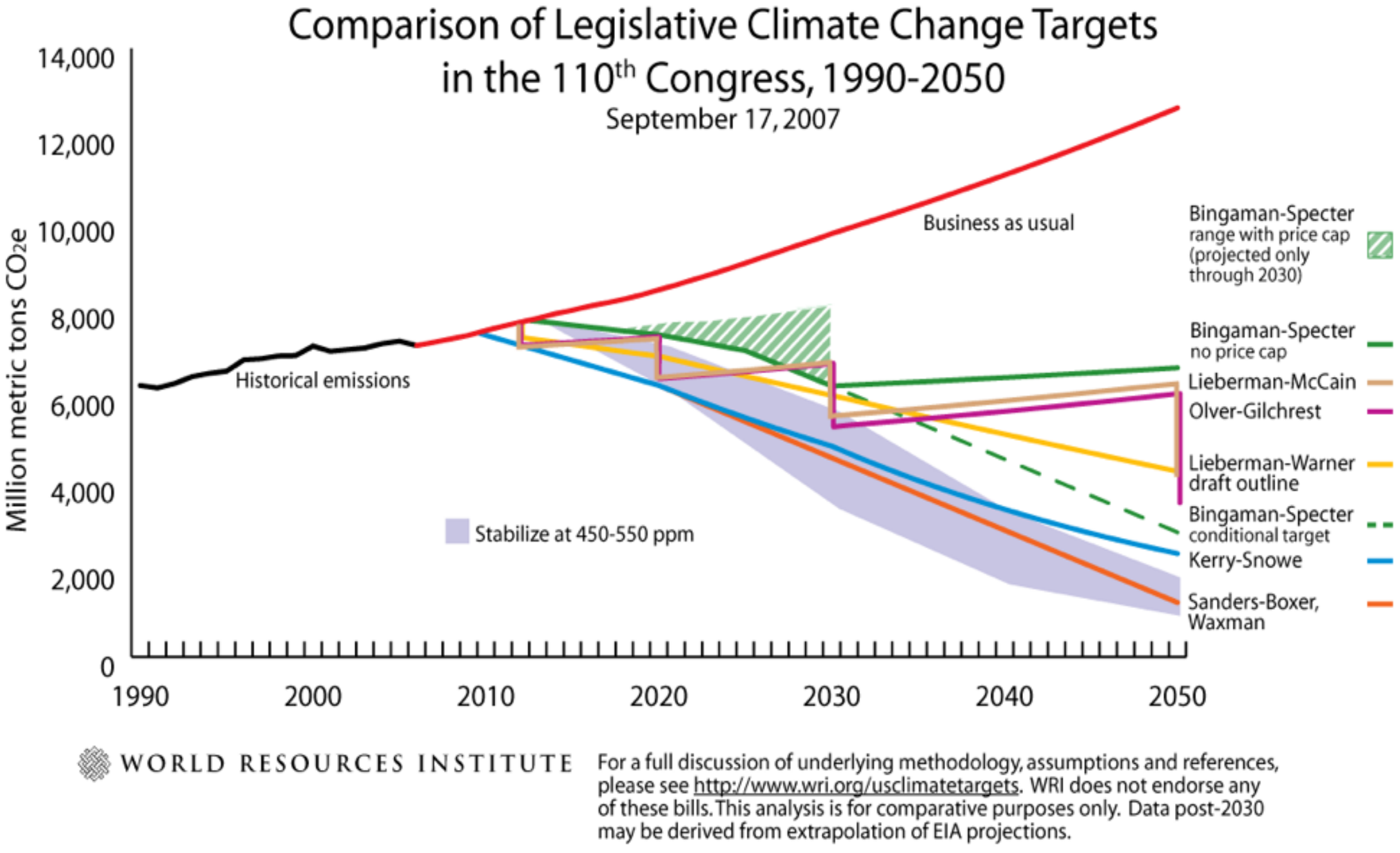


Energy Consumption by End-use Sector, 2005[23]



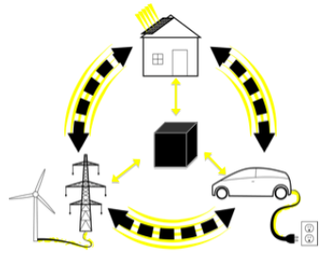
...Bringing Significant Risk to the State in Terms of Climate Legislation...

Climate legislation is primed to increase electricity costs ~50% or more and put carbon-intensive energy sources at risk



Source: World Resources Institute

The Cleantech Upside for Indiana is Significant: Turns Climate Risks into New and Profitable Opportunities



Cleantech Sector	Wind	xEV	Distributed Generation	Second-Generation Biofuels	Clean Coal /Nuclear	Integrated Energy Systems
What is it?	Electricity generation from wind turbines	Vehicles with electric drive, either hybrid, plug-in hybrid, or battery powered	Power generation providing combined heat and electricity	Biofuels made from cellulosic feedstock	Providing reliable baseload energy with an abundant domestic resource, reducing emissions 90%	Systems such as “vehicle to grid” or “vehicle to building” that cross traditional siloed energy sectors
How big is the market?	$80B/y global by 2017	$75B/y global by 2017	~80GW by 2020	$70B/y global by 2017	~80GW by 2020	$100B+ by 2020
Why Indiana?	Companies and assets could play in wind value chain	Strong capabilities in automotive power and energy systems	Emerging companies already providing distributed solutions	Strong potential for cellulose crops and opportunity to leverage life sciences assets	Two commercial clean coal plants, CCS potential, limited renewable capacity	Key assets across different sectors could be combined to create new markets
Federal ARRA Funding	$6B alt energy loan guarantee	$2B advanced battery loans $25B ATVM loans	$11B for transmission grid and SmartGrid	$6B alt energy loan guarantee	$3.4B fossil fuel R&D (clean coal /CCS)	$11B for transmission grid and SmartGrid
	$2B energy efficiency and renewable energy R&D , demonstration , and deployment $1.6B for DOE science and research projects across all sectors					

Source: RMI analysis, EIA

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ENERGY SYSTEMS NETWORK

Energy Systems Network (ESN) provides project development and coordination for joint ventures and cooperative partnerships between network members who are seeking to bring new energy technologies, products, or applications to market .

ESN commercialization projects deliver systems level solutions by drawing on a rich diversity of established and emerging companies and institutions across Indiana and beyond who collectively make up a world-class cleantech cluster with expertise that span the energy ecosystem.

ESN Board of Directors

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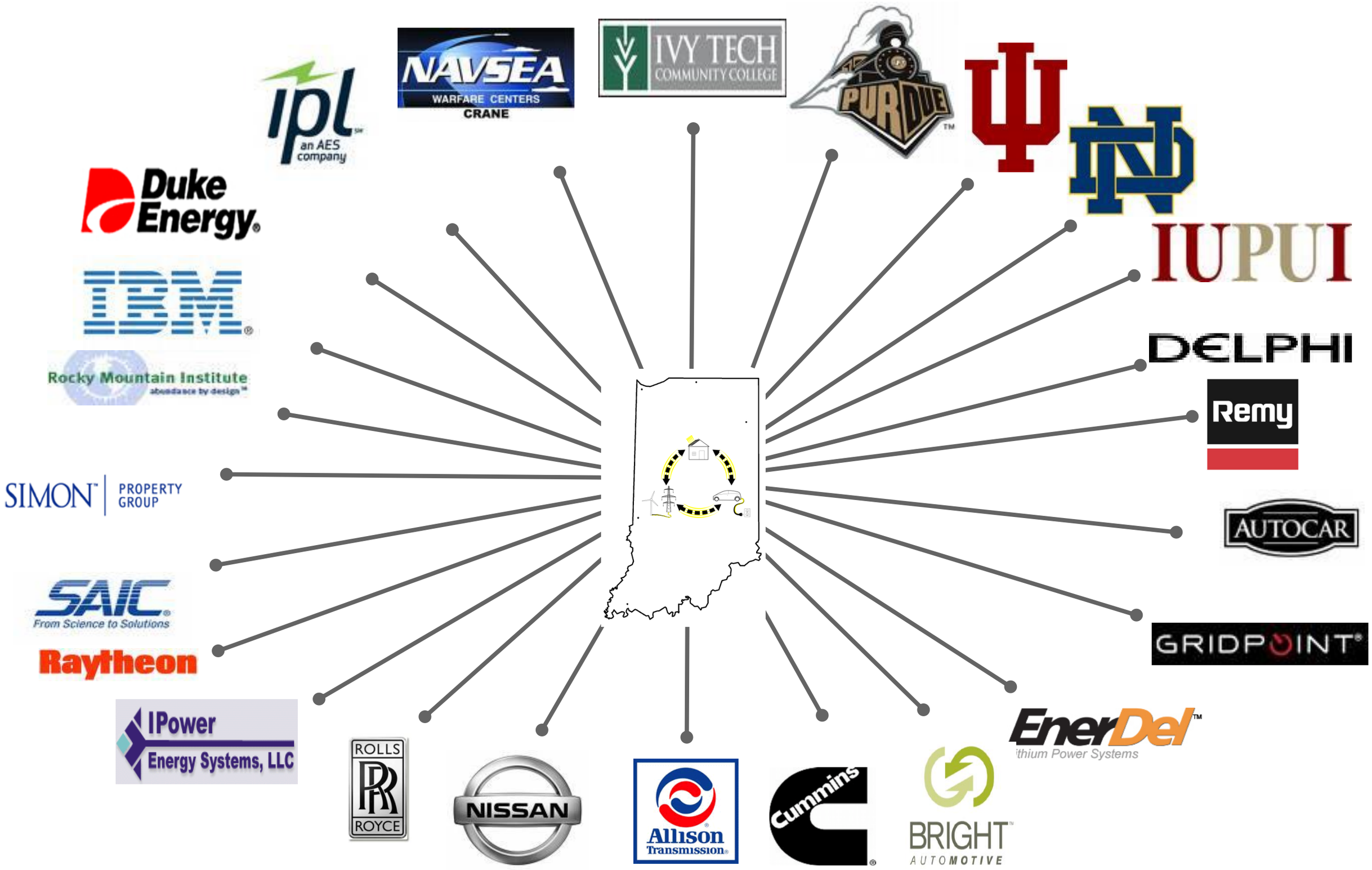

HOOSIER HEAVY HYBRID PARTNERSHIP

Cummins DELPHI Allison Transmission Duke Energy

High Volume Market(s)

Plug-in Smart-Charge

Hybrid Refuse Vehicle

	Project 1	Project 2	Project 3
Project Outcomes	Cost effective diesel electric hybrid power train system for light, medium, and heavy duty vehicles	Smart charge system for plug-in electric vehicles using renewable powered energy storage system	Hybrid refuse vehicle. Partnership with Autocar.
Jobs	1000+ engineers, technicians, and assembly workers	500+ engineers, technicians, and assembly workers	500+ engineers, technicians, and assembly workers
Improved Fuel Economy	Fuel economy up 40+% CO2 emissions down 25+% System cost reduction of 50%	Additional fuel consumption savings by optimizing charging of PHEVs and EVs	Fuel consumption down 40% CO2 Emissions down 40%

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ENERGY SYSTEMS NETWORK

PROJECT PLUG-IN

First of its kind commercial scale pilot of plug-in electric vehicles (PEVs) and smart grid technology working together to demonstrate a transportation energy system solution for the Indianapolis MSA

The pilot will span the service territories of two regulated utilities and provide a model for what's needed to take smart grid and plug-in systems to scale

Our plug-in ecosystem will provide an optimal test bed for accelerating the commercialization of plug-in technologies on the vehicle side, grid side, and in-between

Our Partners

Duke Energy
ipl an AES company
IBM
NISSAN
DELPHI
SIMON PROPERTY GROUP
EnerDel Lithium Power Systems
BRIGHT AUTOMOTIVE
Rocky Mountain Institute
Cummins

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ENERGY SYSTEMS NETWORK

Coming Soon…

I'M GREEN

Integrated Micro-Grid: Resource Energy Efficiency Network

Distributed power generation solutions needed to allow grid independence and support renewable energy development

- Intermittent power is a major challenge facing wind energy and other renewables
- DOD has called for grid independent solutions for bases and forward operations
- Solutions are needed that provide fast and reliable supplemental power up to a MW+

Partnership will develop a scalable (KW to MW) cost effective micro-grid solution that leverages best of class technologies integrated into a scalable system solution for defense and commercial markets (i.e. dual-use) to deliver improved energy efficiency, increased grid reliability, and greater security.

Initial Partners

Duke Energy

SAIC From Science to Solutions

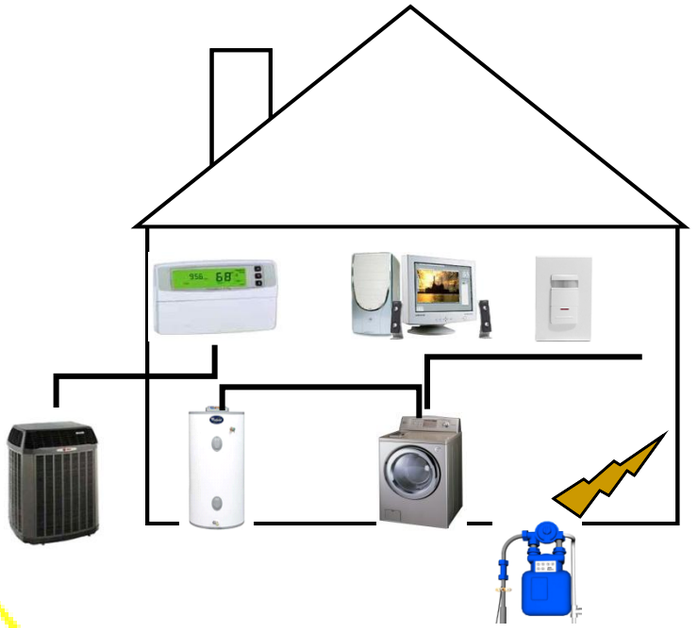
DELPHI

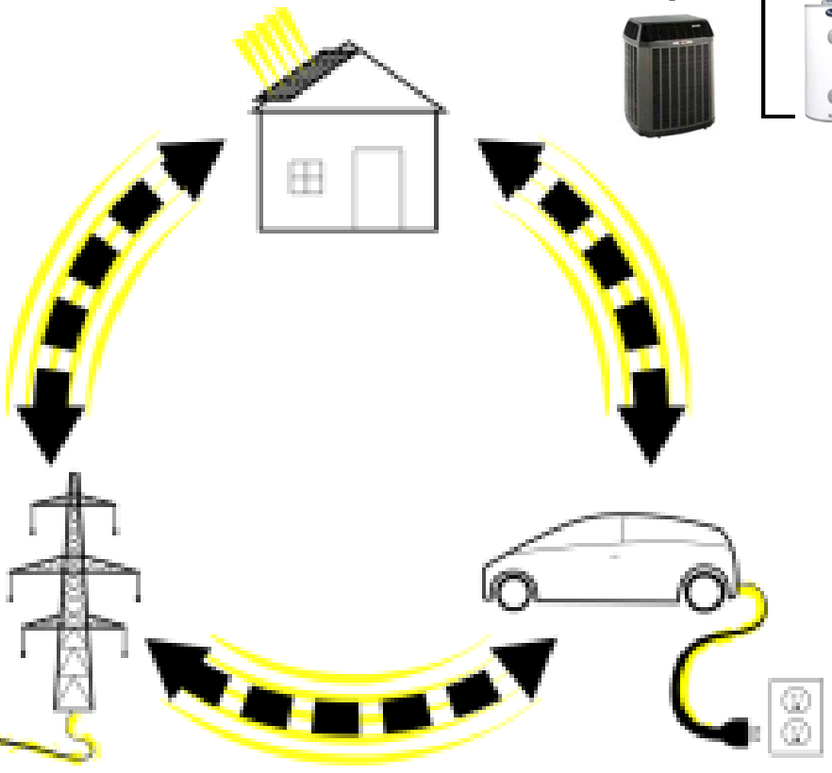
IPower Energy Systems, LLC

NAVSEA WARFARE CENTERS CRANE

Cummins

Innovations In Wind: ‘Some’ Next Steps…





From Distributed to Integrated

Innovations In Wind: ‘Some’ Next Steps…

Integrated Wind Resources

Menu of technologies for a variety of platforms and markets

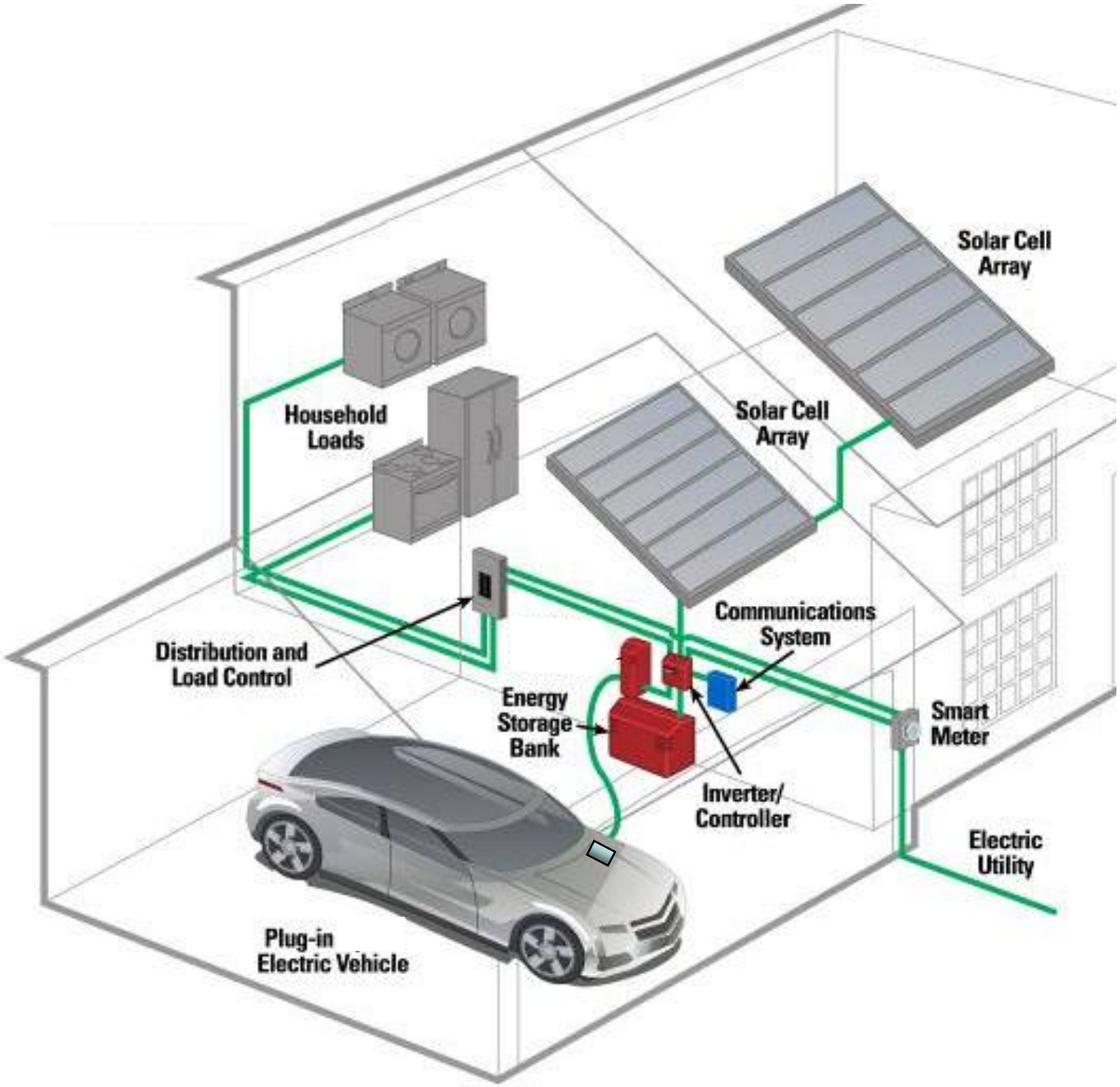
Smaller systems for micro grids/district energy systems

Integrated Energy Storage

Smart Grid enabling ‘Smart Wind’

It's A Group Effort…

But Collaboration Can Work…



Features:

- Smart Interface for Plug-In Vehicle with integrated high power charger
  - Utilizes grid power, solar power, or stored energy
- Renewable Energy System with energy storage
  - Able to provide power to the grid, household loads or plug-in vehicle
- Back-up power with load control
- Communication system between utility and home energy management system
  - Utilizes established home control network standards
  - Utilizes power line and/or RF communications
  - Does not require dedicated wiring
- Smart Meter
  - Net metering
  - Wireless, wide area networks
  - Power line communications network